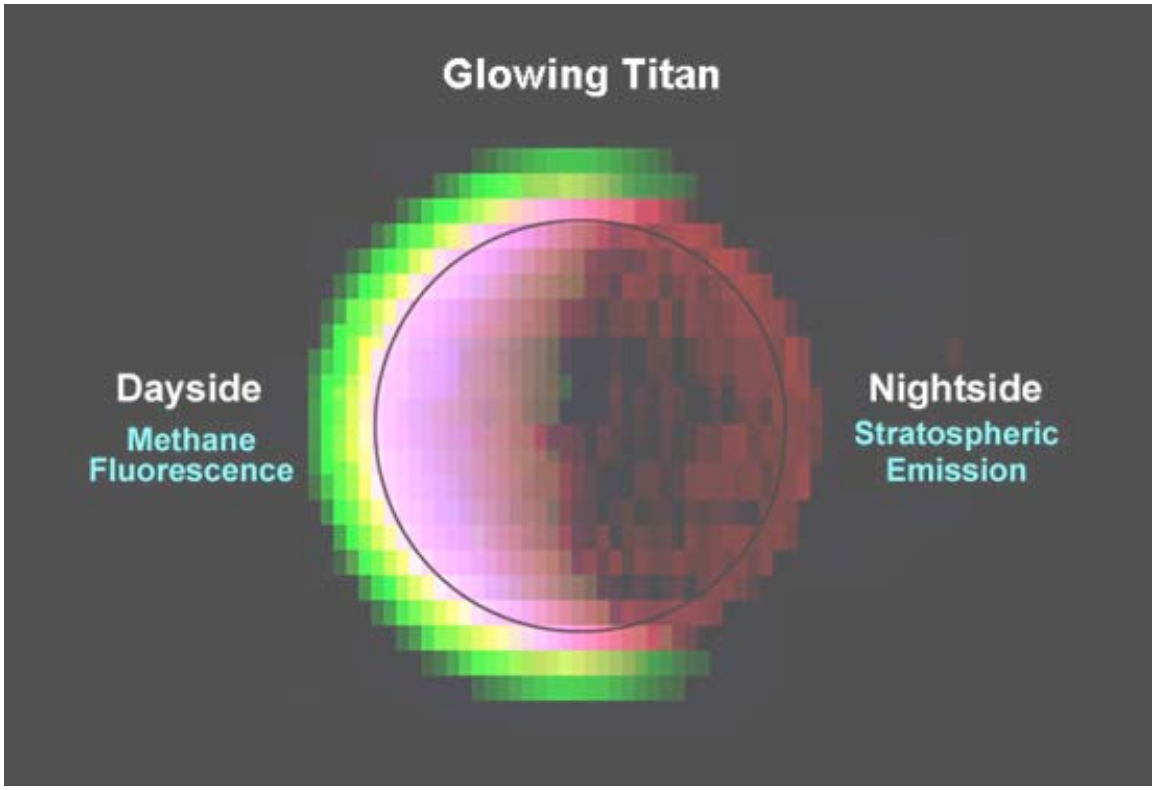
C A S S I N I



T I T A N - A MISSION DESCRIPTION

OCTOBER 2004

Jet Propulsion Laboratory
California Institute of Technology

PD 699-100, Rev O (supplement)
JPL D-5564, Rev O (supplement)
JPL CL#04-3436, Rev. 1 (Last Update: 10/21/04)

1.0 OVERVIEW

The first targeted flyby of Titan occurs on Tuesday, October 26, 2004 at 15:30 UTC (8:30 am Pacific time). Cassini's closest approach to Saturn's largest satellite is at an altitude of 1200 km (746 miles) above the surface AT A SPEED OF 6.1 kilometers per second (14,000 mph). Titan has a diameter of 5150 km (3200 miles), so the spacecraft passes within 1.5 Titan radii.

This encounter is set up with three maneuvers: the Periapsis Raise Maneuver, and Periapsis Raise Maneuver cleanups, both of which took place successfully on August 23 and September 7, 2004, respectively; and the Titan minus three day targeting maneuver, scheduled for October 23rd. Titan A is an inbound flyby, with Saturn periapsis occurring about two days afterwards, on October 28th.

During approach to Saturn, and since orbit insertion, the navigation team has engaged in near-daily optical navigation of Titan and Saturn's other satellites in order to refine their orbit estimates as much as possible. They expect to deliver the orbiter to within 30 km of the target altitude at a confidence of 99% (three sigma).

Titan A is Cassini's second targeted satellite encounter. The first was Phoebe, on June 11, at an altitude of 2,000 km.

1.1 ABOUT TITAN

Titan is a highly complex world and is closer to a terrestrial planet than a moon typical of the outer planetary systems. Titan was first seen by the dutch astronomer Christiaan Huygens (after whom our Titan probe is named) in 1655. Though Galileo was the first person ever to observe the disk of Saturn forty-five years earlier, Huygens' telescopes were more powerful. Huygens was also the first to identify the rings as a flat disc encircling the planet without touching it.

Not only is Titan the largest of Saturn's satellites, it is also larger than the planets Mercury and Pluto, and is the second largest satellite in the solar system (only eclipsed by Ganymede). It is the only satellite in the solar system with an appreciable atmosphere, composed mostly of Nitrogen, but also contains aerosols and hydrocarbons, including methane and ethane. Titan's atmosphere was first confirmed in 1944 when Gerard Kuiper confirmed the presence of gaseous methane with spectroscopy.

Titan's peak surface temperature is about 95°K, and surface pressure is 1.6 Earth atmospheres. At this temperature and pressure, many simple chemicals that are present in abundance (methane, ethane, water, ammonia) provide materials in solid, liquid and gaseous form which may interact to create exotic features on the surface. Precipitation, flowing liquids, lakes, eruptions are all possible.

Titan orbits Saturn at a distance of just over 20 Saturn radii (1,222,000 km / 759,000 miles) which is far enough to carry the moon in and out of Saturn's magnetosphere. Titan's orbital period is 16 days, and the orbit has a slight inclination of 0.33 degrees and eccentricity of 0.03. Like most of the major satellites of Saturn, and Earth's moon, Titan is tidally locked to the planet, with the same face pointed towards it at all times. Very little is known about Titan's interior structure, including whether it has its own magnetic field.

Titan's surface has been difficult to study, as it is veiled by a dense hydrocarbon haze that forms in the dense stratosphere as methane is destroyed by sunlight. From the data collected so far, dark features can be seen crossing the equatorial region of Titan, with a large bright region near longitude 90 degrees now named "Xanadu", and possibly a large crater in the northern hemisphere.

1.2 TITAN-A SCIENCE ACTIVITIES

The Cassini/Huygens project is interested in four broad science themes concerning Titan: its interior stucture, surface characteristics, atmospheric properties, and interaction with Saturn's magnetosphere.

Titan A will provide the first in-situ sampling of Titan's atmosphere ever. This will contribute significantly to atmospheric model updates necessary to validate the 950 km minimum flyby altitude (and perhaps the Huygens mission profile as well). The sources of this improvement will come primarily from INMS data and AACS attitude control telemetry during the flyby.

CAPS will make its first measurements of Titan's upper ionosphere and gather science from Cassini's first crossing through Titan's plasma wake. They will make both ion and electron measurements during the flyby, except for the period from about closest approach –85 to –30 minutes.

CIRS will measure the stratospheric temperatures versus pressure (and therefore density), in part to contribute to Huygens mission validation at the altitudes of parachute deployment.

ISS will conduct its first medium and high resolution imaging of Titan, including imaging of the Huygens landing site. The cameras will perform distant observations at about 2.7 kilometers per pixel, a full-disk color mosaic at about 2 km/pixel, regional to global mapping of the western bright/dark boundary at 200-600 meters per pixel, and very high resolution imaging of an edge of a bright area at 23-81 meters per pixel.

INMS, again, will perform the first ever in situ measurements of Titan's upper atmosphere, to determine the density and composition.

MAG will perform a detailed study of Titan's interaction with Saturn's magnetosphere during the entire flyby, as well as further constrain the possible internal magnetic field of Titan.

MIMI will examine Titan's exosphere with ENA imaging and characterize the ion composition and charge state near Titan.

RADAR will perform its first Synthetic Aperture Radar (SAR) imaging of Titan's surface, as well as scatterometry of the Huygens landing site. Scatterometry should provide roughness and solid/liquid discrimination, and radiometry should contribute to temperature mapping.

RPWS will take measurements while passing through Titan's ionosphere and contribute to the understanding of Titan's interaction with Saturn's magnetosphere.

UVIS will perform two high resolution scans across Titan to investigate the composition and distribution of aerosols.

VIMS hopes to perform surface composition and fluid feature mapping (lakes, rivers), as well as see aerosol and cloud structures in the atmosphere, methane fluorescence and look for volcanic activity. They also contribute to mapping of the Huygens landing site at 1 km spatial resolution.

1.3 TITAN-A SEQUENCE OF EVENTS AND SAMPLE SNAPSHOTS

The Titan-A flyby does not require use of the live update capability; however, the encounter does occupy a ground movable block with 15 minutes of dead time on each end. Very little of this dead time is expected to be necessary, as even the latest trajectory (041001) lists a flyby shift (compared to 030201) of only 14 seconds.

Cassini Titan-A Timeline - October 2004

Colors: yellow = maneuvers; blue = geometry; red = Ta-related; green = data playbacks

Orbiter UTC	Ground UTC	Pacific Time	Time wrt Ta	Activity	Description
292T05:30	Oct 18 06:45	Sun Oct 17 11:45 PM	Ta-08d10h	Start of S05 background sequence	Start of 28-day sequence which contains Titan-A flyby
297T00:16	**Oct 23 01:30**	**Fri Oct 22 06:30 PM**	**Ta-03d15h**	**OTM #4**	**Titan-A minus three day targeting maneuver**
299T17:01	Oct 25 18:15	Mon Oct 25 11:15 AM	Ta-22h29m	Dead time	15 minutes long; used to accommodate changes in flyby time
299T17:16	Oct 25 18:30	Mon Oct 25 11:30 AM	Ta-22h14m	Begin approach observations	
300T04:00	Oct 26 05:14	Mon Oct 25 10:14 PM	Ta-11h30m	Begin medium resolution obs	
300T10:30	Oct 26 11:44	Tue Oct 26 04:44 AM	Ta-05h00m	Begin high resolution observations	
300T13:42	Oct 26 14:56	Tue Oct 26 07:56 AM	Ta-01h48m	Transition to thruster control	Required for RADAR pointing profile; duration = 21 minutes
300T14:03	Oct 26 15:17	Tue Oct 26 08:17 AM	Ta-01h27m	Turn High-Gain Antenna to Titan	
300T14:15	Oct 26 15:29	Tue Oct 26 08:29 AM	Ta-01h15m	Begin inbound RADAR scatterometry	
300T14:45	Oct 26 15:59	Tue Oct 26 08:59 AM	Ta-00h45m	Turn cameras back to Titan	
300T15:18	Oct 26 16:32	Tue Oct 26 09:32 AM	Ta-00h12m	Turn INMS to Titan ram direction, High-Gain Antenna to Titan	
300T15:24	Oct 26 16:38	Tue Oct 26 09:38 AM	Ta-00h06m	Begin INMS atmospheric collection	
300T15:30	**Oct 26 16:44**	**Tue Oct 26 09:44 AM**	**Ta+00h00m**	**Titan-A flyby closest approach**	**Altitude = 1200 km (746 miles), speed = 6.1 km/s (14,000 mph); low phase inbound, 91 deg phase at closest approach, high phase outbound**
300T15:30	Oct 26 16:44	Tue Oct 26 09:44 AM	Ta+00h00m	Begin high resolution RADAR SAR imaging	
300T15:36	Oct 26 16:50	Tue Oct 26 09:50 AM	Ta+00h06m	Begin low resolution RADAR SAR imaging	
300T15:46	Oct 26 17:00	Tue Oct 26 10:00 AM	Ta+00h16m	Begin RADAR altimetry	
300T16:00	Oct 26 17:14	Tue Oct 26 10:14 AM	Ta+00h30m	Begin outbound RADAR scatterometry	
300T16:45	Oct 26 17:59	Tue Oct 26 10:59 AM	Ta+01h15m	Transition back to reaction wheels	Duration = 24 minutes
300T16:53	Oct 26 18:07	Tue Oct 26 11:07 AM	Ta+01h23m	Ascending Ring-Plane Crossing	19.5 radii from Saturn; no dust expected
300T17:09	Oct 26 18:23	Tue Oct 26 11:23 AM	Ta+01h39m	Begin RADAR radiometry	
300T23:46	Oct 27 01:00	Tue Oct 26 06:00 PM	Ta+08h16m	Dead time	15 minutes long; used to accommodate changes in flyby time
301T00:01	Oct 27 01:15	Tue Oct 26 06:15 PM	Ta+08h31m	Turn to Earth-line	Max turn time = 15 minutes
301T00:16	**Oct 27 01:30**	**Tue Oct 26 06:30 PM**	**Ta+08h46m**	**Begin playback of Titan-A data**	**Madrid 70m pass; Goldstone 34m pass also for last hour of playback (dual coverage for INMS/AACS data)**
301T00:27	Oct 27 01:41	Tue Oct 26 06:41 PM	Ta+08h57m	First Titan-A images returned	Distant observations at ~2.7 km/pixel
301T02:01	Oct 27 03:15	Tue Oct 26 08:15 PM	Ta+10h31m	Medium resolution images returned	2 km/pixel observations
301T03:37	Oct 27 04:51	Tue Oct 26 09:51 PM	Ta+12h07m	High resolution images returned	200-600 m/pixel observations
301T05:26	Oct 27 06:40	Tue Oct 26 11:40 PM	Ta+13h56m	Highest resolution images returned	23-81 km/pixel observations
301T06:16	Oct 27 07:30	Wed Oct 27 12:30 AM	Ta+14h46m	RADAR SAR data returned	High-resolution Synthetic Aperture Radar imagery
301T09:16	**Oct 27 10:30**	**Wed Oct 27 03:30 AM**	**Ta+17h46m**	**End playback of Titan-A data**	
302T10:19	Oct 28 11:33	Thu Oct 28 04:33 AM	Ta+01d19h	Saturn periapse	Closest approach to Saturn, at 6.2 Saturn radii, 104 deg phase
302T19:59	Oct 28 21:13	Thu Oct 28 02:13 PM	Ta+02d04h	Descending ring-plane crossing	8.1 radii from Saturn; cross through outer edge of E ring (very small particles)
303T00:15	**Oct 29 01:29**	**Thu Oct 28 06:29 PM**	**Ta+02d09h**	**OTM #5**	**Titan-A plus three day cleanup maneuver**

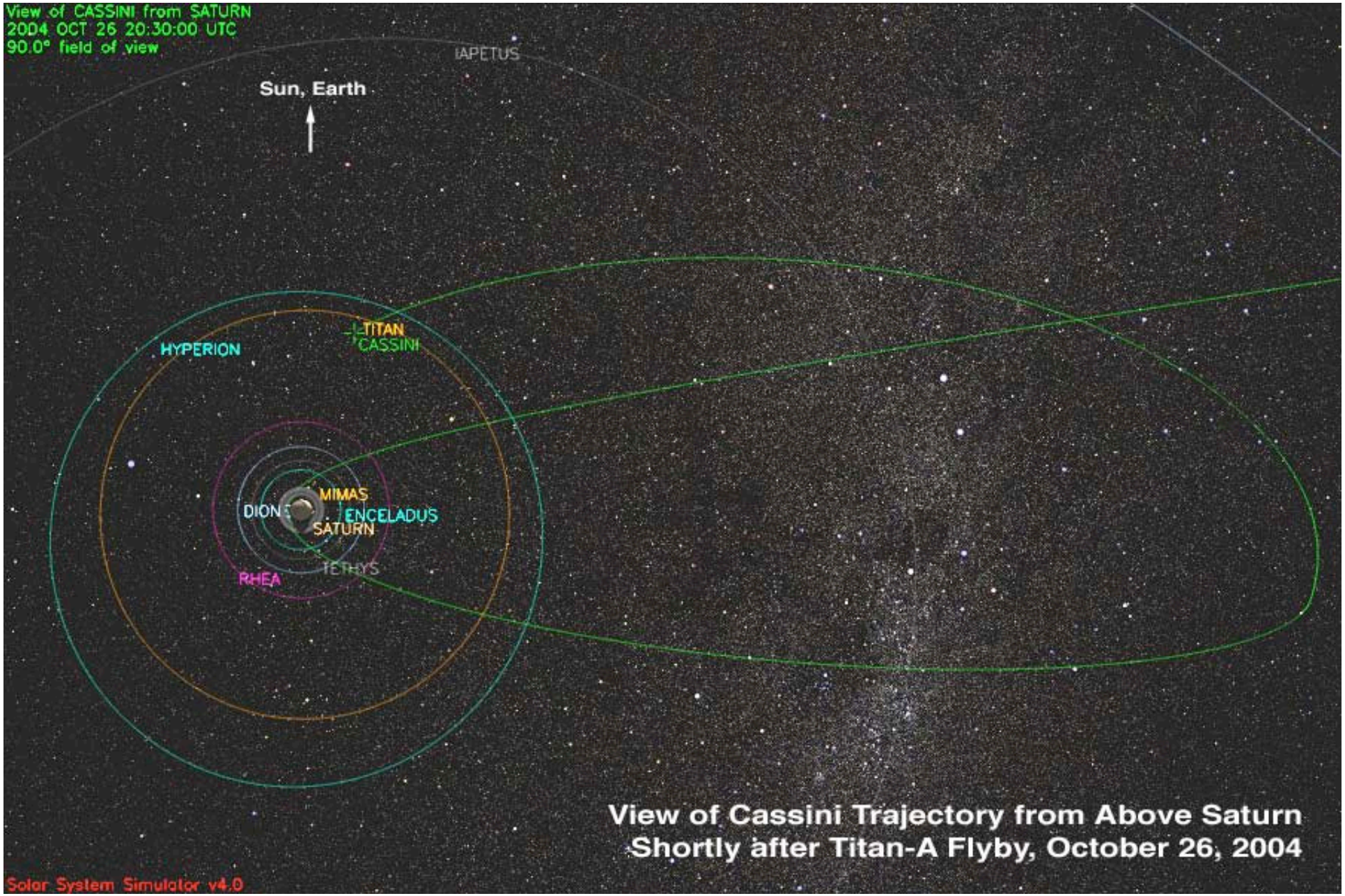
Version: 2004 Oct 05

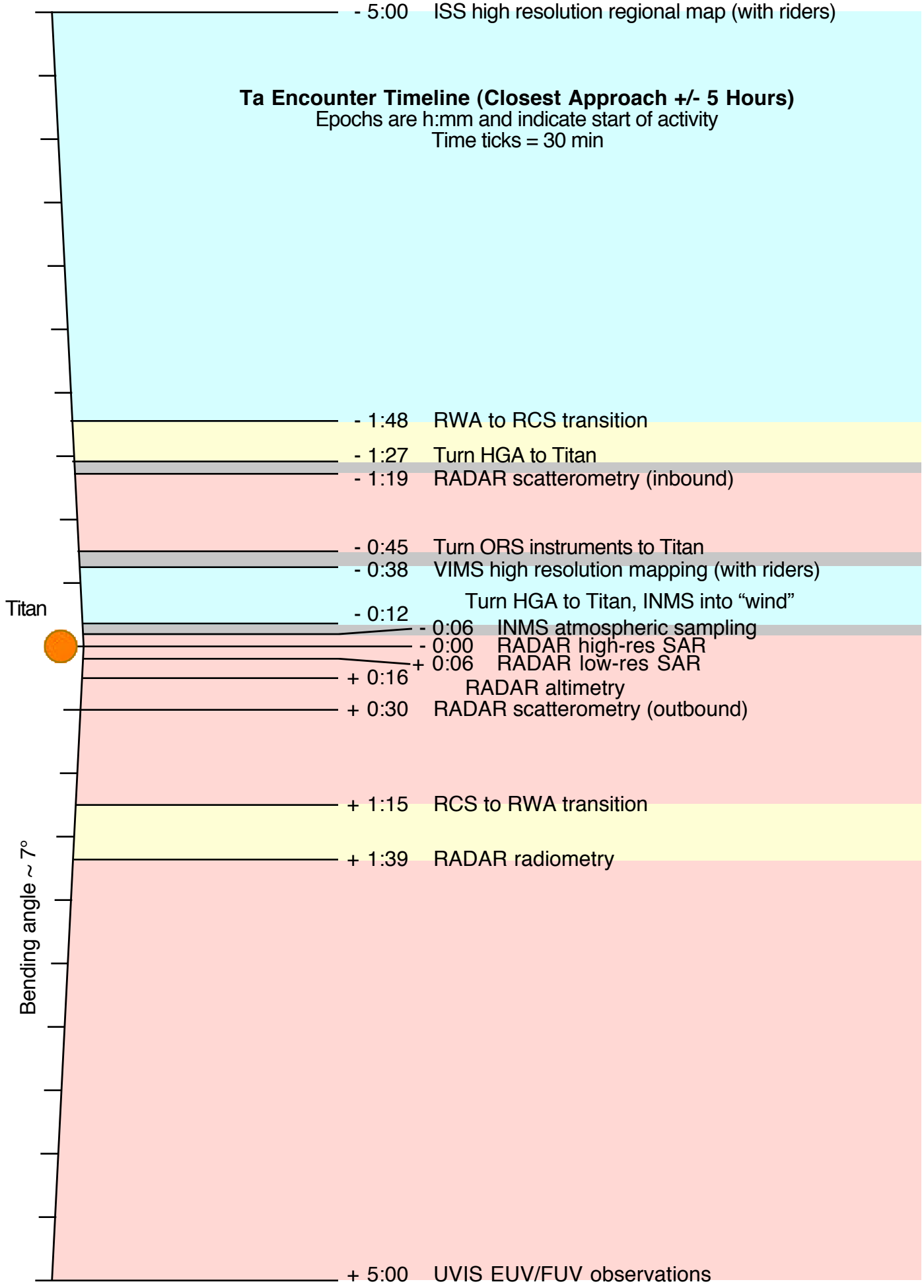
Last Updated: 10/21/04 - Subject to change.

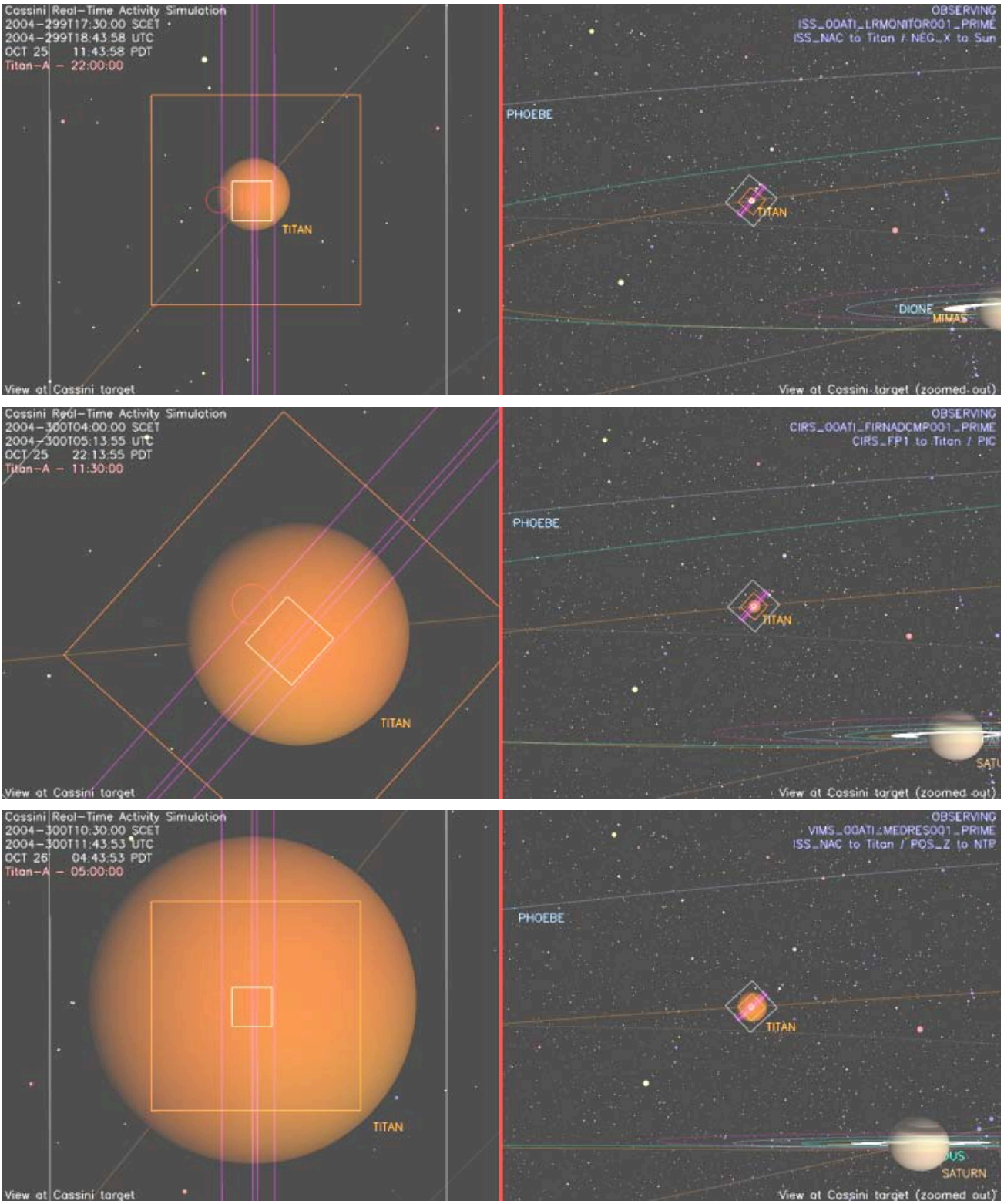
Orbiter UTC is the actual time of the spacecraft event.

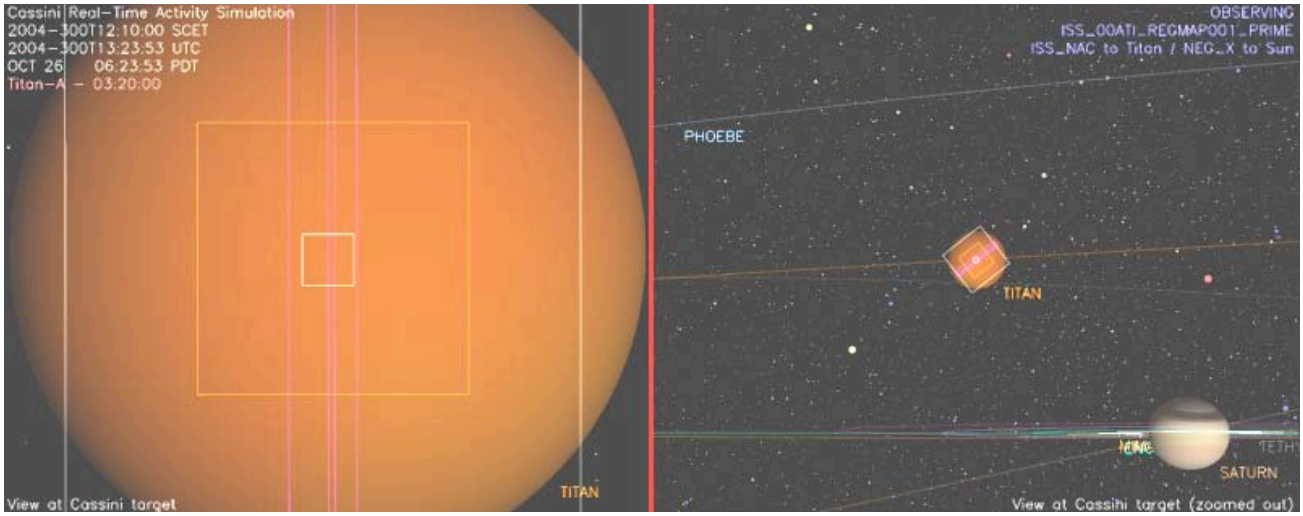
Ground UTC is the time when the signal reaches Earth.

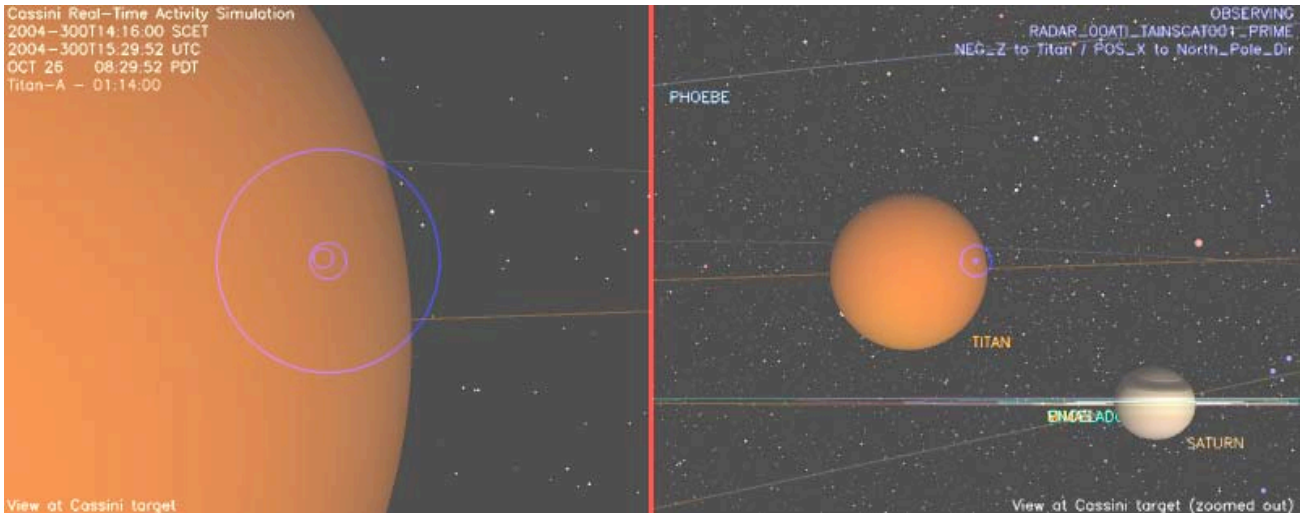
It takes about 1 hour and 14 minutes for the signal to travel from the spacecraft to Earth.

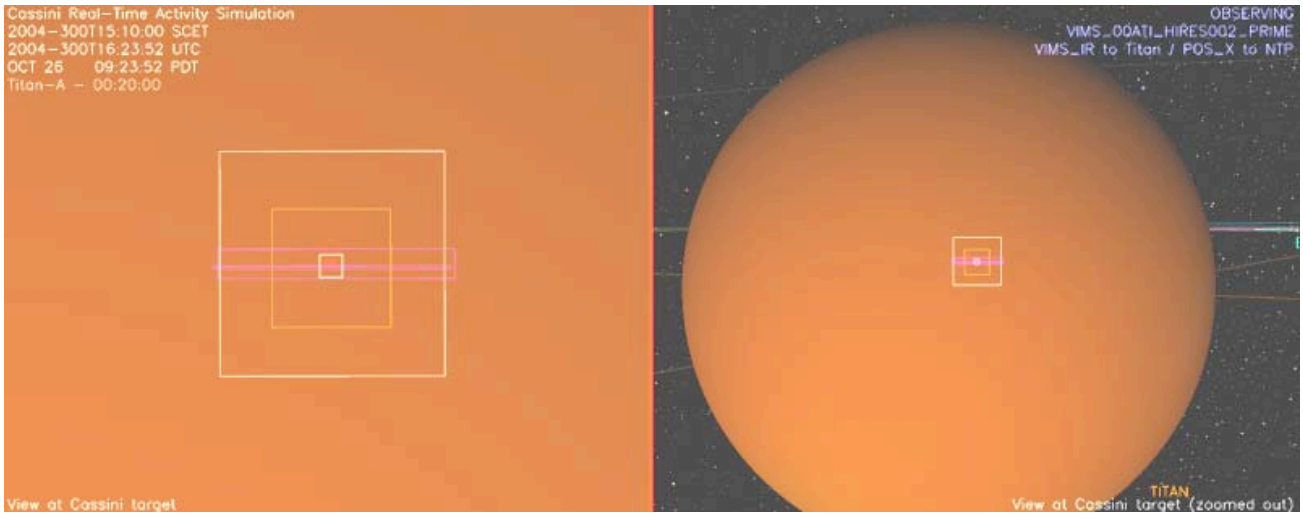

View of CASSINI from SATURN
2004 OCT 26 20:30:00 UTC
90.0° field of view
IAPETUS
Sun, Earth
HYPERION
TITAN
CASSINI
MIMAS
DIONE
ENCELADUS
SATURN
TETHYS
RHEA
Solar System Simulator v4.0
View of Cassini Trajectory from Above Saturn
Shortly after Titan-A Flyby, October 26, 2004

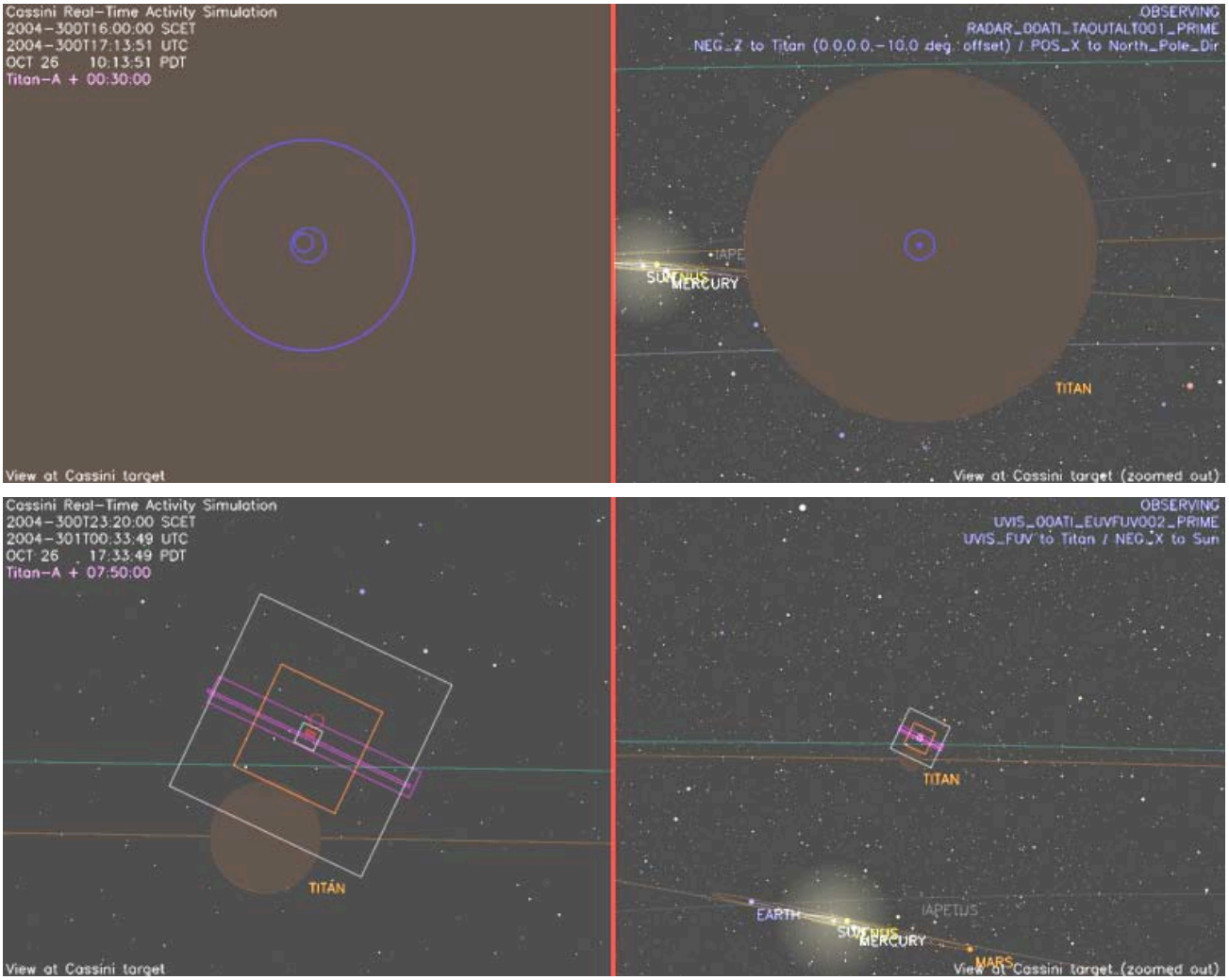

- 5:00 ISS high resolution regional map (with riders)
Ta Encounter Timeline (Closest Approach +/- 5 Hours)
Epochs are h:mm and indicate start of activity
Time ticks = 30 min
- 1:48 RWA to RCS transition
- 1:27 Turn HGA to Titan
- 1:19 RADAR scatterometry (inbound)
- 0:45 Turn ORS instruments to Titan
- 0:38 VIMS high resolution mapping (with riders)
Turn HGA to Titan, INMS into “wind”
- 0:12
- 0:06 INMS atmospheric sampling
- 0:00 RADAR high-res SAR
+ 0:06 RADAR low-res SAR
+ 0:16
RADAR altimetry
+ 0:30 RADAR scatterometry (outbound)
+ 1:15 RCS to RWA transition
+ 1:39 RADAR radiometry
+ 5:00 UVIS EUV/FUV observations
Titan
Bending angle ~ 7°


Cassini Real-Time Activity Simulation
2004-299T17:30:00 SCET
2004-299T18:43:58 UTC
OCT 25 11:43:58 PDT
Titan-A - 22:00:00
TITAN
View at Cassini target
OBSERVING
ISS_00ATI_LRMONITOR001_PRIME
ISS_NAC to Titan / NEG_X to Sun
PHOEBE
TITAN
DIONE
MIMAS
View at Cassini target (zoomed-out)
Cassini Real-Time Activity Simulation
2004-300T04:00:00 SCET
2004-300T05:13:55 UTC
OCT 25 22:13:55 PDT
Titan-A - 11:30:00
TITAN
View at Cassini target
OBSERVING
CIRS_00ATI_FIRNADCMP001_PRIME
CIRS_FP1 to Titan / PIC
PHOEBE
TITAN
View at Cassini target (zoomed-out)
Cassini Real-Time Activity Simulation
2004-300T10:30:00 SCET
2004-300T11:43:53 UTC
OCT 26 04:43:53 PDT
Titan-A - 05:00:00
TITAN
View at Cassini target
OBSERVING
VIMS_00ATI_MEDRES001_PRIME
ISS_NAC to Titan / POS_Z to NTP
PHOEBE
TITAN
SATURN
View at Cassini target (zoomed-out)


Cassini Real-Time Activity Simulation
2004-300T12:10:00 SCET
2004-300T13:23:53 UTC
OCT 26 06:23:53 PDT
Titan-A - 03:20:00
TITAN
View at Cassini target
OBSERVING
ISS_00ATI_REGMAP001_PRIME
ISS_NAC to Titan / NEG_X to Sun
PHOEBE
TITAN
TETH
SATURN
View at Cassini target (zoomed out)


Cassini Real-Time Activity Simulation
2004-300T14:16:00 SCET
2004-300T15:29:52 UTC
OCT 26 08:29:52 PDT
Titan-A - 01:14:00
View at Cassini target
OBSERVING
RADAR_00ATI_TAINSCAT001_PRIME
NEG_Z to Titan / POS_X to North_Pole_Dir
PHOEBE
TITAN
SATURN
View at Cassini target (zoomed out)


Cassini Real-Time Activity Simulation
2004-300T15:10:00 SCET
2004-300T16:23:52 UTC
OCT 26 09:23:52 PDT
Titan-A - 00:20:00
View at Cassini target
OBSERVING
VIMS_00ATI_HIRES002_PRIME
VIMS_IR to Titan / POS_X to NTP
TITAN
View at Cassini target (zoomed out)



Also, no special fault protection is planned for the Titan-A flyby. The nominal tour fault protection strategies should be sufficient to protect the spacecraft from any unexpected events.

1.4 TA DATA RECORDING AND PLAYBACK

The Titan-A data recording and playback strategy is the same as the nominal tour strategy, with one notable exception. INMS and AACS data collected at closest approach will be rerouted to partition 5 and saved until near the end of the downlink pass, so that it may be played back over two complexes. This was done to further ensure successful playback as these data sets contribute to the minimum Titan altitude and Huygens mission.

Goldstone's 70m station is down for nearly the entire latter half of 2004 for preventitive maintenance and upgrades, so the high priority science is played back over Madrid's 70m dish. Goldstone's 34m HEF station comes up near the end of the pass as the redundant station for INMS and AACS data playback.

A detailed time ordered description of the data playback is shown on the following pages. The SSR is nearly filled during the flyby with a total of 3.5 Gbit of data. Playback begins on DOY 301 at 00:16 (spacecraft time) and completes at 09:16. Dual playback to both Madrid and Goldstone takes place during the last hour of the downlink (08:16-09:16 SCET).

One-way light time at the time of the encounter is 1 hour and 14 minutes.

Titan Ta Approximate Playback Timeline

Event or Observation	Observation Type (AGPEN)	Observation Record Start Time (SCET)	Start Playback of Downlink Event (Tuesday is 2004-300, Oct. 26)			ISS imgs (NAC/WAC)	Max Resolution (km, NAC/WAC)
			Orbiter UTC	Ground UTC	Pacific Time		
BEGIN A5 Playback (CRITICAL DATA)			Wed 12:26 AM	Wed 01:40 AM	Tue 06:40 PM		
Critical data redirected to P5 consists of INMS and AACS within +/- 20 min. of closest approach (2004-300T15:10:09 to 300T15:50:09 SCET)							
INMS_00ATI_TACLOSE001_RIDER	INMS_1498	2004-300T14:30:09	Wed 12:26 AM	Wed 01:40 AM	Tue 06:40 PM		
INMS_00ATI_TARAMPNT001_PRIME	INMS_1498	2004-300T15:17:09	Wed 12:26 AM	Wed 01:40 AM	Tue 06:40 PM		
INMS_00ATI_TACLOSE002_RIDER	INMS_1498	2004-300T15:30:09	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
BEGIN A4 Playback			Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
CDA_00ADR_SURAFTPPL003_RIDER	CDA_524	2004-292T09:30:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
CAPS_00ASA_SURVEY012_RIDER	CAPS_16000	2004-298T09:01:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
MAG_00AOT_SURVEY013_PRIME	MAG_1976	2004-298T09:01:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
MIMI_00ACO_SURVEY013_RIDER	MIMI_8000	2004-298T09:01:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
RPWS_00ASA_OUTSURVEY014_PRIME	RPWS_30464	2004-298T09:01:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
UVIS_00ASW_IPHSURVEY084_RIDER	UVIS_5032	2004-299T07:31:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
INMS_00ASA_SURVEY002_RIDER	INMS_1498	2004-299T14:50:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
CAPS_00ASA_SURVEY007_RIDER	CAPS_16000	2004-299T16:31:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
MAG_00AOT_SURVEY003_PRIME	MAG_1976	2004-299T16:31:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
RPWS_00ASA_OUTSURVEY005_PRIME	RPWS_30464	2004-299T16:31:00	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
MIMI_00ACO_SURVEY004_RIDER	MIMI_8000	2004-299T16:31:01	Wed 12:27 AM	Wed 01:40 AM	Tue 06:40 PM		
ISS_00ATI_LRMONITOR001_PRIME	ISS_Phot_1_by_1	2004-299T17:16:09	Wed 12:27 AM	Wed 01:41 AM	Tue 06:41 PM	10/0	2.7/27
VIMS_00ATI_ISS006_ISS	VIMS_18432	2004-299T17:16:09	Wed 12:27 AM	Wed 01:41 AM	Tue 06:41 PM		
CIRS_00ATI_MIDIRTMAP001_PRIME	CIRS_4000	2004-299T17:30:09	Wed 12:29 AM	Wed 01:43 AM	Tue 06:43 PM		
CIRS_00ATI_MIDIRTMAP001_SI	ISS_SUPPORT_IMAGING	2004-299T17:30:09	Wed 12:29 AM	Wed 01:43 AM	Tue 06:43 PM		
ISS_00ATI_MIDIRTMAP001_CIRS	ISS_Phot_1_by_1	2004-299T17:30:09	Wed 12:29 AM	Wed 01:43 AM	Tue 06:43 PM	0/14	2.1/21
VIMS_00ATI_MIDIR005_CIRS	VIMS_18432	2004-299T17:30:09	Wed 12:29 AM	Wed 01:43 AM	Tue 06:43 PM		
CIRS_00ATI_FIRNADCMP008_ISS	CIRS_4000	2004-299T22:45:09	Wed 12:56 AM	Wed 02:10 AM	Tue 07:10 PM		
ISS_00ATI_MONITORNA001_PRIME	ISS_Phot_1_by_1	2004-299T22:45:09	Wed 12:56 AM	Wed 02:10 AM	Tue 07:10 PM	63/6	1.9/19
VIMS_00ATI_ISS005_ISS	VIMS_18432	2004-299T22:45:09	Wed 12:56 AM	Wed 02:10 AM	Tue 07:10 PM		
CIRS_00ATI_FIRNADCMP001_PRIME	CIRS_4000	2004-300T00:00:09	Wed 01:11 AM	Wed 02:25 AM	Tue 07:25 PM		
CIRS_00ATI_FIRNADCMP001_SI	ISS_SUPPORT_IMAGING	2004-300T00:00:09	Wed 01:11 AM	Wed 02:25 AM	Tue 07:25 PM		
ISS_00ATI_FIRNADCMP001_CIRS	ISS_Phot_1_by_1	2004-300T00:00:09	Wed 01:11 AM	Wed 02:25 AM	Tue 07:25 PM	0/7	1.4/14
VIMS_00ATI_FARIRNAD004_CIRS	VIMS_18432	2004-300T00:00:09	Wed 01:11 AM	Wed 02:25 AM	Tue 07:25 PM		
INMS_00ATI_TAINBD001_RIDER	INMS_1498	2004-300T03:30:23	Wed 01:58 AM	Wed 03:12 AM	Tue 08:12 PM		
CIRS_00ATI_FIRNADCMP009_VIMS	CIRS_4000	2004-300T04:00:09	Wed 02:01 AM	Wed 03:15 AM	Tue 08:15 PM		
ISS_00ATI_MEDRES001_VIMS	ISS_Phot_1_by_1	2004-300T04:00:09	Wed 02:01 AM	Wed 03:15 AM	Tue 08:15 PM	12/36	0.60/6.0
UVIS_00ATI_EUVFUV001_VIMS	UVIS_5032	2004-300T04:00:09	Wed 02:01 AM	Wed 03:15 AM	Tue 08:15 PM		
VIMS_00ATI_MEDRES001_PRIME	VIMS_18432	2004-300T04:00:09	Wed 02:01 AM	Wed 03:15 AM	Tue 08:15 PM		
RADAR_00ATI_TAWARMUP001_RIDER	RADAR_364800	2004-300T10:15:09	Wed 03:07 AM	Wed 04:21 AM	Tue 09:21 PM		
CIRS_00ATI_FIRNADCMP007_ISS	CIRS_4000	2004-300T10:30:09	Wed 03:09 AM	Wed 04:23 AM	Tue 09:23 PM		
ISS_00ATI_REGMAP001_PRIME	ISS_Phot_1_by_1	2004-300T10:30:09	Wed 03:09 AM	Wed 04:23 AM	Tue 09:23 PM	87/1	0.40/4.0
VIMS_00ATI_HIGHRES005_ISS	VIMS_18432	2004-300T10:30:09	Wed 03:09 AM	Wed 04:23 AM	Tue 09:23 PM		
MAG_00ATI_MAGTITAN001_PRIME	MAG_1976	2004-300T11:58:16	Wed 03:34 AM	Wed 04:48 AM	Tue 09:48 PM		
ISS_00ATI_HIRESNAC001_PRIME	ISS_Phot_1_by_1	2004-300T12:10:09	Wed 03:37 AM	Wed 04:51 AM	Tue 09:51 PM	87/1	0.21/2.1
BEGIN A4 Playback of Downlink Science and Engineering			Wed 04:30 AM	Wed 05:44 AM	Tue 10:44 PM		
BEGIN B4 Playback			Wed 04:42 AM	Wed 05:56 AM	Tue 10:56 PM		
CAPS_00ATI_TAINBND001_RIDER	CAPS_16000	2004-300T13:30:09	Wed 04:45 AM	Wed 05:59 AM	Tue 10:59 PM		
RPWS_00ATI_TIINTRMED001_PRIME	RPWS_30464	2004-300T13:30:09	Wed 04:45 AM	Wed 05:59 AM	Tue 10:59 PM		
CIRS_00ATI_FIRNADCMP009_RIDER	CIRS_4000	2004-300T13:42:09	Wed 05:14 AM	Wed 06:28 AM	Tue 11:28 PM		
ISS_00ATI_RADRCS300_ENGR	ISS_Phot_1_by_1	2004-300T13:42:09	Wed 05:14 AM	Wed 06:28 AM	Tue 11:28 PM	23/23	0.17/1.7
VIMS_00ATI_TRANS003_ENGR	VIMS_18432	2004-300T13:42:09	Wed 05:14 AM	Wed 06:28 AM	Tue 11:28 PM		

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Titan Ta Approximate Playback Timeline

Event or Observation	Observation Type (AGPEN)	Observation Record Start Time (SCET)	Start Playback of Downlink Event (Tuesday is 2004-300, Oct. 26)			ISS imgs (NAC/WAC)	Max Resolution (km, NAC/WAC)
			Orbiter UTC	Ground UTC	Pacific Time		
MIMI_00ATI_TAINBND001_RIDER	MIMI_8000	2004-300T13:44:36	Wed 05:14 AM	Wed 06:28 AM	Tue 11:28 PM		
ISS_00ATI_WAYPTTURN001_PRIME	ISS_Phot_1_by_1	2004-300T14:02:09	Wed 05:18 AM	Wed 06:32 AM	Tue 11:32 PM		
RADAR_00ATI_TAINSCAT001_PRIME	RADAR_364800	2004-300T14:11:09	Wed 05:22 AM	Wed 06:36 AM	Tue 11:36 PM		
INMS_00ATI_TACLOSE001_RIDER	INMS_1498	2004-300T14:30:09	Wed 05:24 AM	Wed 06:38 AM	Tue 11:38 PM		
MIMI_00ATI_TACLOSE001_RIDER	MIMI_8000	2004-300T14:30:09	Wed 05:24 AM	Wed 06:38 AM	Tue 11:38 PM		
CIRS_00ATI_FIRNADMAP009_VIMS	CIRS_4000	2004-300T14:45:09	Wed 05:26 AM	Wed 06:40 AM	Tue 11:40 PM		
ISS_00ATI_HIRES002_VIMS	ISS_Phot_1_by_1	2004-300T14:45:09	Wed 05:26 AM	Wed 06:40 AM	Tue 11:40 PM	18/29	0.023/0.23
VIMS_00ATI_HIRES002_PRIME	VIMS_18432	2004-300T14:45:09	Wed 05:26 AM	Wed 06:40 AM	Tue 11:40 PM		
CAPS_00ATI_TACLOSE001_RIDER	CAPS_16000	2004-300T14:51:09	Wed 05:29 AM	Wed 06:43 AM	Tue 11:43 PM		
RPWS_00ATI_TICA001_PRIME	RPWS_182784	2004-300T15:02:39	Wed 05:35 AM	Wed 06:49 AM	Tue 11:49 PM		
INMS_00ATI_TARAMPNT001_PRIME	INMS_1498	2004-300T15:17:09	Wed 05:51 AM	Wed 07:05 AM	Wed 12:05 AM		
RADAR_00ATI_TAPT4INMS001_PRIME	RADAR_364800	2004-300T15:18:09	Wed 05:54 AM	Wed 07:08 AM	Wed 12:08 AM		
RPWS_00ATI_TICA002_PRIME	RPWS_182784	2004-300T15:24:09	Wed 06:06 AM	Wed 07:20 AM	Wed 12:20 AM		
INMS_00ATI_TACLOSE002_RIDER	INMS_1498	2004-300T15:30:09	Wed 06:16 AM	Wed 07:30 AM	Wed 12:30 AM		
RADAR_00ATI_TAHIGHSAR001_PRIME	RADAR_364800	2004-300T15:30:09	Wed 06:16 AM	Wed 07:30 AM	Wed 12:30 AM		
MP_00ATI_FLYBYTA999_NA	MILESTONE	2004-300T15:30:09	Wed 06:16 AM	Wed 07:30 AM	Wed 12:30 AM		
RADAR_00ATI_TALOWSAR001_PRIME	RADAR_364800	2004-300T15:36:09	Wed 06:36 AM	Wed 07:50 AM	Wed 12:50 AM		
RADAR_00ATI_TAOUTALT001_PRIME	RADAR_364800	2004-300T15:46:09	Wed 07:02 AM	Wed 08:16 AM	Wed 01:16 AM		
RPWS_00ATI_TIINTRMED002_PRIME	RPWS_30464	2004-300T15:57:39	Wed 07:10 AM	Wed 08:24 AM	Wed 01:24 AM		
RADAR_00ATI_TAOUTSCAT001_PRIME	RADAR_364800	2004-300T16:00:09	Wed 07:11 AM	Wed 08:25 AM	Wed 01:25 AM		
CAPS_00ATI_TAOUTBND001_RIDER	CAPS_16000	2004-300T16:09:09	Wed 07:15 AM	Wed 08:29 AM	Wed 01:29 AM		
INMS_00ATI_TAOUTBD001_RIDER	INMS_1498	2004-300T16:30:09	Wed 07:23 AM	Wed 08:37 AM	Wed 01:37 AM		
MIMI_00ATI_TAOUTBND001_RIDER	MIMI_8000	2004-300T16:30:09	Wed 07:23 AM	Wed 08:37 AM	Wed 01:37 AM		
MP_00ASA_RPXASCEND999_NA	MILESTONE	2004-300T16:52:26	Wed 07:29 AM	Wed 08:43 AM	Wed 01:43 AM		
RADAR_00ATI_TAOUTRAD001_PRIME	RADAR_364800	2004-300T17:09:09	Wed 07:30 AM	Wed 08:44 AM	Wed 01:44 AM		
CAPS_00ASA_SURVEY002_RIDER	CAPS_16000	2004-300T17:30:09	Wed 07:33 AM	Wed 08:47 AM	Wed 01:47 AM		
RPWS_00ASA_OUTSURVEY004_PRIME	RPWS_30464	2004-300T17:30:09	Wed 07:33 AM	Wed 08:47 AM	Wed 01:47 AM		
MIMI_00ACO_SURVEY003_RIDER	MIMI_8000	2004-300T17:44:47	Wed 07:35 AM	Wed 08:49 AM	Wed 01:49 AM		
MAG_00AOT_SURVEY005_PRIME	MAG_1976	2004-300T19:02:02	Wed 07:42 AM	Wed 08:56 AM	Wed 01:56 AM		
CIRS_00ATI_FIRNADCMP006_UVIS	CIRS_4000	2004-300T20:30:09	Wed 07:50 AM	Wed 09:04 AM	Wed 02:04 AM		
ISS_00ATI_EUVFUV002_UVIS	ISS_Phot_1_by_1	2004-300T20:30:09	Wed 07:50 AM	Wed 09:04 AM	Wed 02:04 AM	32/43	1.0 / 10
UVIS_00ATI_EUVFUV002_PRIME	UVIS_5032	2004-300T20:30:09	Wed 07:50 AM	Wed 09:04 AM	Wed 02:04 AM		
VIMS_00ATI_DARKSIDE004_UVIS	VIMS_18432	2004-300T20:30:09	Wed 07:50 AM	Wed 09:04 AM	Wed 02:04 AM		
UVIS_00ASW_IPHSURVEY085_RIDER	UVIS_5032	2004-301T00:16:00	Wed 08:15 AM	Wed 09:29 AM	Wed 02:29 AM		
BEGIN B4 Playback of Downlink Science and Engineering			Wed 08:15 AM	Wed 09:29 AM	Wed 02:29 AM		
BEGIN A5 Playback (CRITICAL DATA)			Wed 08:16 AM	Wed 09:30 AM	Wed 02:30 AM		
Critical data redirected to P5 consists of INMS and AACS within +/- 20 min. of closest approach (2004-300T15:10:09 to 300T15:50:09 SCET)							
INMS_00ATI_TACLOSE001_RIDER	INMS_1498	2004-300T14:30:09	Wed 08:16 AM	Wed 09:30 AM	Wed 02:30 AM		
INMS_00ATI_TARAMPNT001_PRIME	INMS_1498	2004-300T15:17:09	Wed 08:16 AM	Wed 09:30 AM	Wed 02:30 AM		
INMS_00ATI_TACLOSE002_RIDER	INMS_1498	2004-300T15:30:09	Wed 08:17 AM	Wed 09:31 AM	Wed 02:31 AM		
RESUME B4 Playback of Downlink Science and Engineering			Wed 08:17 AM	Wed 09:31 AM	Wed 02:31 AM		
END Playback			Wed 09:08 AM	Wed 10:22 AM	Wed 03:22 AM		

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